



GCSE

BIOLOGY

8461/2F

Paper 2F

Mark scheme

Specimen (set 2)

Version: 1.0

Keep secure

Please be aware that not all schools and colleges will be using these tests at the same time.

Help us to maintain the security of these papers by ensuring they are not distributed on social media or other platforms.

Important – please note

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers.

It must be stressed that a mark scheme is a working document. This mark scheme has **not** been through the full standardisation process. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way.

Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

The Information to Examiners is included as a guide to how the mark scheme will function as an operational document.

The layout has been kept consistent so that future operational mark schemes do not appear different from these test materials.

If the printing process in your school alters the scale of a diagram, measure the values on your printed papers and mark the scripts accordingly.

Information to Examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement
- the Assessment Objectives, level of demand and specification content that each question is intended to cover.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right-hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening and underlining

- 2.1** In a list of acceptable answers where more than one mark is available ‘any **two** from’ is used, with the number of marks emboldened. Each of the following bullet points is a potential mark.
- 2.2** A bold **and** is used to indicate that both parts of the answer are required to award the mark.
- 2.3** Alternative answers acceptable for a mark are indicated by the use of **or**. Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.
- 2.4** Any wording that is underlined is essential for the marking point to be awarded.

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error / contradiction negates each correct response. So, if the number of error / contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution?

[1 mark]

Student	Response	Marks awarded
1	green, 5	0
2	red*, 5	1
3	red*, 8	0

Example 2: Name two planets in the solar system.

[2 marks]

Student	Response	Marks awarded
1	Neptune, Mars, Moon	1
2	Neptune, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a student writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

3.3 Marking procedure for calculations

Marks should be awarded for each stage of the calculation completed correctly, as students are instructed to show their working. Full marks can, however, be given for a correct numerical answer, without any working shown.

3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward is kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation ecf in the marking scheme.

3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.7 Brackets

(.....) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

3.8 Allow

In the mark scheme additional information, 'allow' is used to indicate creditworthy alternative answers.

3.9 Ignore

Ignore is used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

3.10 Do not accept

Do **not** accept means that this is a wrong answer which, even if the correct answer is given as well, will still mean that the mark is not awarded.

4. Level of response marking instructions

Extended response questions are marked on level of response mark schemes.

- Level of response mark schemes are broken down into levels, each of which has a descriptor.
- The descriptor for the level shows the average performance for the level.
- There are two marks in each level.

Before you apply the mark scheme to a student's answer, read through the answer and annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

Step 1: Determine a level

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level. The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer.

When assigning a level you should look at the overall quality of the answer. Do **not** look to penalise small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level.

Use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 2 with a small amount of level 3 material it would be placed in level 2 but be awarded a mark near the top of the level because of the level 3 content.

Step 2: Determine a mark

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this.

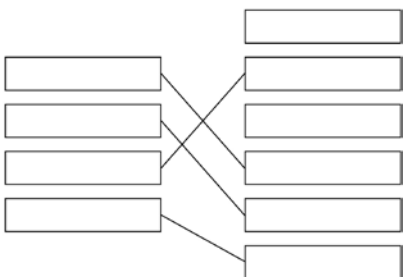
The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do **not** have to cover all of the points mentioned in the indicative content to reach the highest level of the mark scheme.

You should ignore any irrelevant points made. However, full marks can be awarded only if there are no incorrect statements that contradict a correct response.

An answer which contains nothing of relevance to the question must be awarded no marks.

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
01.1	Carl Linnaeus		1	AO1 4.6.4 Low
01.2	Lithops	extras cancel ignore capitalisation / non-capitalisation	1	AO2 4.6.4 Low
01.3		1 mark per line extra line from adaptation negates the mark for that adaptation	1 1 1 1	AO2 4.7.1.4 Low
01.4	any two from: <ul style="list-style-type: none"> • cooler underground / at night or the jerboa can keep cool • loses less water or sweats less • less likely to be seen (by predators / prey) 		2	AO2 4.7.1.4 Low
01.5	behavioural		1	AO2 4.7.1.4 Low
Total			9	

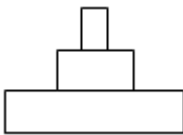
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Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
02.1	46		1	AO1 4.6.1.8 Low
02.2	23	allow ecf from 2.1 – ie half of answer given in 2.1	1	AO1 4.6.1.2 4.6.1.8 Low
02.3	egg sperm ovary meiosis fertilisation	correct order only correct spelling only	1 1 1 1 1	AO1 4.6.1.1 4.6.1.1 4.6.1.1 4.6.1.2 4.6.1.2 Low
02.4		all 4 correct = 2 marks 2 or 3 correct = 1 mark 0 or 1 correct = 0 marks ignore correct / incorrect identification of male and female offspring	2	AO2/2 4.6.1.6 4.6.1.8 Low
02.5	1 in 2		1	AO3 4.6.1.6 4.6.1.8 Low

02.6	<p>any two from:</p> <ul style="list-style-type: none"> • multiple genes determine appearance • different combinations of alleles • different environmental effects • from different egg / sperm 	<p>allow several / many genes determine appearance</p> <p>allow description of combinations of alleles' allow genes for alleles</p> <p>allow example eg eat different diets</p>	2	<p>AO1 AO2 4.6.1.6 4.6.2.1 Standard</p>
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Total			12
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Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
03.1	A		1	AO1 4.5.3.1 Low
03.2	E		1	AO1 4.5.3.1 Low
03.3	28	allow 27–29	1	AO1 4.5.3.1 Low
03.4	progesterone		1	AO1 4.5.3.4 Low
03.5	any two from: <ul style="list-style-type: none"> • inhibits FSH production / release • prevents egg maturation • prevents ovulation 	allow prevents egg growth allow prevents egg release ignore prevents egg production	2	AO1 4.5.3.5 Low Standard
03.6	oestrogen testosterone	allow in this order only	1 1	AO1 4.5.3.5 Low
Total			8	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
04.1	correct figures from graph: 5.0 / 5 and 2.60 / 2.6	an answer of 2.40 / 2.4 scores 2 marks	1	AO2
	2.40 / 2.4	allow correct answer from candidate's figures from graph for 1 mark	1	AO3 4.7.1.2 4.7.5 Low
04.2	$\frac{1}{3}$		1	AO2 4.7.1.2 4.7.5 Standard
04.3	protein		1	AO1 4.4.2.3 Low
04.4	a genetically-modified variety of seed was sown in 2004		1	AO3 (S4.3.1.4) (S4.4.2.3)
	more rain fell in spring and early summer in 2004		1	S4.4.1.2 4.7.1.1 4.7.1.2
	the mean summer temperature was lower in 2003		1	4.7.5 Low
04.5			1	AO2 4.7.4.2 Low

04.6	80		1	AO2 4.7.4.3 Standard
04.7	chickens use energy for movement and for keeping warm		1	AO2 4.4.2.1
	much of the food eaten by chickens is wasted as faeces		1	4.7.4.3 Low
Total			11	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand												
05.1	to kill microorganisms on / in the flask or so only microorganisms in the milk caused the results	allow bacteria / fungi / microbes do not accept viruses ignore germs	1	AO1 4.7.2.3 4.1.1.6 Low												
05.2	heating to over 100 °C	allow place in oven / pressure cooker do not accept disinfectant allow other suitable method – eg use of UV	1 1	AO1 4.7.2.3 4.1.1.6 Low												
05.3	to prevent microorganisms entering from the air	allow bacteria / fungi / microbes for microorganisms do not accept viruses ignore germs	1	AO1 4.7.2.3 4.1.1.6 Low												
05.4	<table border="1"> <tbody> <tr> <td>0</td> <td>olive-green</td> <td>7</td> </tr> <tr> <td>1</td> <td>olive-green</td> <td>7</td> </tr> <tr> <td>2</td> <td>olive-green</td> <td>7</td> </tr> <tr> <td>3</td> <td>orange-green</td> <td>6</td> </tr> </tbody> </table>	0	olive-green	7	1	olive-green	7	2	olive-green	7	3	orange-green	6	all correct for 1 mark	1	AO3 4.7.2.3 Low
0	olive-green	7														
1	olive-green	7														
2	olive-green	7														
3	orange-green	6														
05.5	(pH meter) – more accurate / more precise (leaving...6 days) – obtain greater pH change or because there was (very) little change in 3 days	allow more exact allow can measure to 0.1 pH unit or to smaller intervals of pH allow more acid will be made	1 1	AO3 4.7.2.3 Low												

05.6	scale > ½ of x-axis and x-axis labelled (time in) days		1	AO2 4.7.2.3 Low
	points plotted correctly	all 7 correct = 2 marks 5 or 6 correct = 1 mark	2	
	line of best fit = smooth curve through points	do not accept ruled point-to- point	1	
05.7	(1 st day) too few bacteria		1	AO2 4.7.2.3
	(after day 1 more bacteria so more) acid made		1	
	(days 5-6) sugar / food used up or low pH denatures enzymes or low pH kills bacteria	allow enzymes do not work do not accept enzymes killed	1	S4.2.2.1 Standard
05.8	(similarity) – same start pH / pH7 and end pH / pH4.5 or same pH change / change = 2.5		1	AO2 4.7.2.3 4.1.1.6 4.2.2.1 Low Standard
	(difference) – faster		1	
Total			16	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
06.1	any one from: <ul style="list-style-type: none"> • animal / plant (dies and) body covered in sediment / mud • bones / shells / hard parts do not decay • minerals enter bones / parts are replaced by other materials / mineralisation • preserved traces / footprints / burrows / rootlet traces / impressions / casts 	allow covered in tar / ice	1	AO1 4.6.3.5 Low
06.2	(diameter P =) 60 and (diameter Q =) 75	allow \pm 1mm	1	AO2 4.6.3.5 Low
06.3	150	allow ecf from 06.2	1	AO2 4.6.3.5 Low
06.4	2.5		1	AO2 4.6.3.5 Low
06.5	any two from: <ul style="list-style-type: none"> • Q has fewer spirals • Q has more (radial) ridges • Q's ridges are more pronounced • Q has more elongated shape 	allow stripes / etc accept Q is less circular / round allow other correct descriptions	2	AO3 4.6.3.5 Low

06.6	Q was found in newer rocks than P		1	AO3 4.6.3.5 Low
06.7	100 million years		1	AO1 4.6.3.5 Low
06.8	any three from: <ul style="list-style-type: none"> • flooding • drought • ice age • volcanic activity • asteroid collision • (new) predators (allow hunters / poachers) • (new) disease / named pathogen • competition for food • competition for mates • isolation lack of habitat or habitat change	ignore pollution } if none of these points given allow climate change / global warming / weather change / environmental change for 1 mark } if none of these points given allow natural disaster / catastrophic event for 1 mark	3	AO1 4.6.3.6 Low
06.9	lack of evidence or cannot perform experiment to find out	do not accept no evidence allow no proof allow no one was there to observe	1	AO3 4.6.3.5 4.6.3.6 Low
Total			12	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
07.1	times are very short / in milliseconds or milliseconds cannot be measured with a stopwatch		1	AO3 4.5.2.1 Standard
07.2	to increase validity / repeatability or to get representative results	allow to give a more reliable mean value	1	AO2 4.5.2.1 Standard
	because of variation in results	allow to identify any anomalies	1	
07.3	(they have included) 468 / the 7th result	allow identification of anomaly in the table	1	AO3 4.5.2.1 Standard
	(which) is anomalous / is a much higher value (than the others)		1	
07.4	$\frac{275}{259}$	an answer of 1.06 (: 1) scores 2 marks	1	AO2 4.5.2.1 Standard
	1.06 (: 1)	allow max 1 mark if wrong number of sig. figs.	1	
07.5	2.59×10^{-1} seconds		1	AO2 4.5.2.1 Standard

07.6	<p>any two from:</p> <ul style="list-style-type: none"> • cannot compare mean to B as it has been incorrectly calculated • C's mean reaction time is the longest, not the shortest • only measured one type of reaction <p>or</p> <ul style="list-style-type: none"> cannot generalise to all reaction types • other factors can influence reaction time 	allow examples	2	AO3 4.5.2.1 Standard
07.7	involves (the conscious part of) the brain	allow voluntary (re)action	1	AO2 4.5.2.1 Standard
Total			11	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
08.1	(molecules are) (too) large cannot pass through (filtration) membrane / (holes in) filter	allow 'is not filtered out of the blood'	1 1	AO1 4.5.3.3 Standard
08.2	glucose is reabsorbed <u>all</u> of it	ignore 'is absorbed' unless qualified by 'into blood'	1 1	AO1 4.5.3.3 Standard
08.3	(molecules/ions) small so pass through filter or not all is reabsorbed more water reabsorbed on a hot day due to more water lost in sweat	allow the body needs to maintain the right balance of ions and urea in the blood ignore 'are filtered' unqualified } 'more' needed at least once to gain both marks	1 1 1	AO1 AO2 4.5.3.3 Standard

08.4	Level 3: A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.	5–6	AO3 AO2 4.5.3.3 Standard
	Level 2: A judgement, supported by some relevant reasons is given.	3–4	
	Level 1: Relevant points are made. If there is a judgement, this is asserted, but not logically linked to the points made.	1–2	
	No relevant content	0	
	Indicative content pro transplant: <ul style="list-style-type: none"> • (dialysis requires repeated treatments to prevent) build-up of toxins or to prevent raised blood pressure between sessions • inconvenience of dialysis, eg long sessions of immobility or repeated hospital visits • (dialysis requires restricted diet) to prevent build-up of urea / ions • there is a greater risk of infection with dialysis eg repeated puncturing of skin or use of non-sterile equipment allows entry of microorganisms • there is a risk of blood clots with dialysis • dialysis more expensive in the long term / 2+ years or examples given eg 2 yrs dialysis = £60 000 compared with 2 yrs after transplant = (£51 000 + £5 000) = £56 000 • transplant is a long term treatment or may remain healthy for many years con transplant: <ul style="list-style-type: none"> • shortage of kidney donors leading to long waiting time • requires death of another person or live donation leaving a person with just one kidney • exploitation of poor people for donor kidneys (paying for organs) • need to match tissue type • rejection – role of wbc's / lymphocytes • need immunosuppressant drugs – susceptibility to infection • dangers of surgery – physical damage / infection / brain damage from anaesthetic • high initial cost – limited funding (either personal or NHS / CCG) 		
Total		13	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
09.1	any two from: <ul style="list-style-type: none"> • sprinkled through air • air spaces between stones • thin layer over stones (for efficient diffusion) • slow flow (for efficient diffusion) 		2	AO2 4.7.3.1 4.7.3.2 4.4.2.1 Standard
09.2	green algae		1	AO1 4.7.2.1 4.7.4.1 Standard
09.3	(large / small) protist		1	AO1 4.7.4.1 Standard

09.4	Level 2: Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.	3–4	AO1 4.7.2.2 4.7.2.3 4.7.4.1 4.2.2.1 4.4.2.1 Standard
	Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.	1–2	
	No relevant content	0	
	Indicative content digestion: <ul style="list-style-type: none"> • (external) enzymes released • role of enzymes – eg amylase / protease / lipase • substrates & products – eg starch→sugar / protein→amino acids / fat→fatty acids absorption: <ul style="list-style-type: none"> • by diffusion / active transport deamination: <ul style="list-style-type: none"> • amino acids→ammonia / ammonium ions release of other ions: <ul style="list-style-type: none"> • eg phosphate / nitrate / magnesium respiration: <ul style="list-style-type: none"> • produces carbon dioxide (+ water) or equation is given • release of energy allows other processes to take place eg active transport 		
Total		8	